

The Mining Journal

Established 1835

Railway & Commercial Gazette

Vol. CCXXXIX No. 6100

LONDON, JULY 18, 1952

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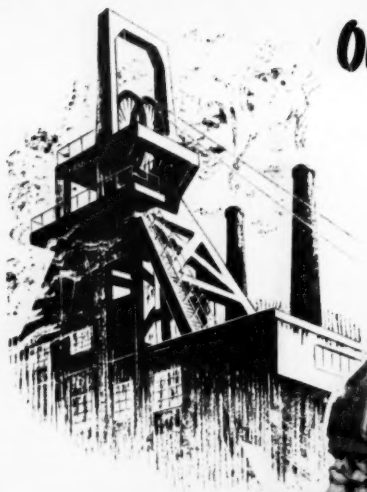
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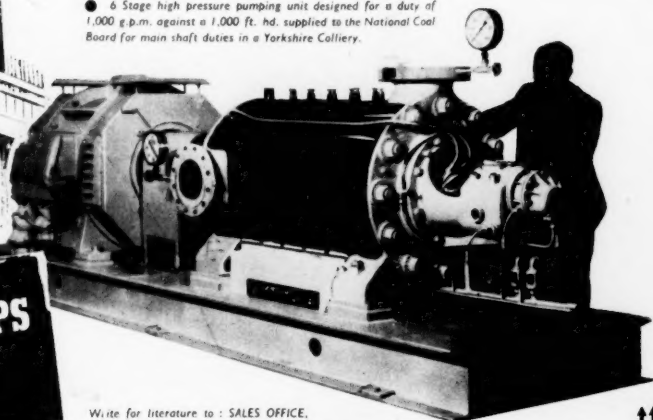
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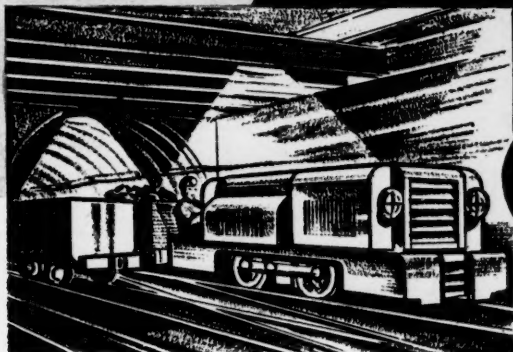
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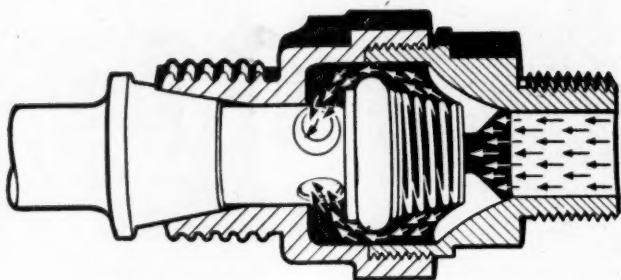
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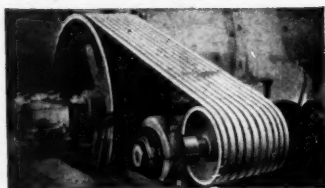
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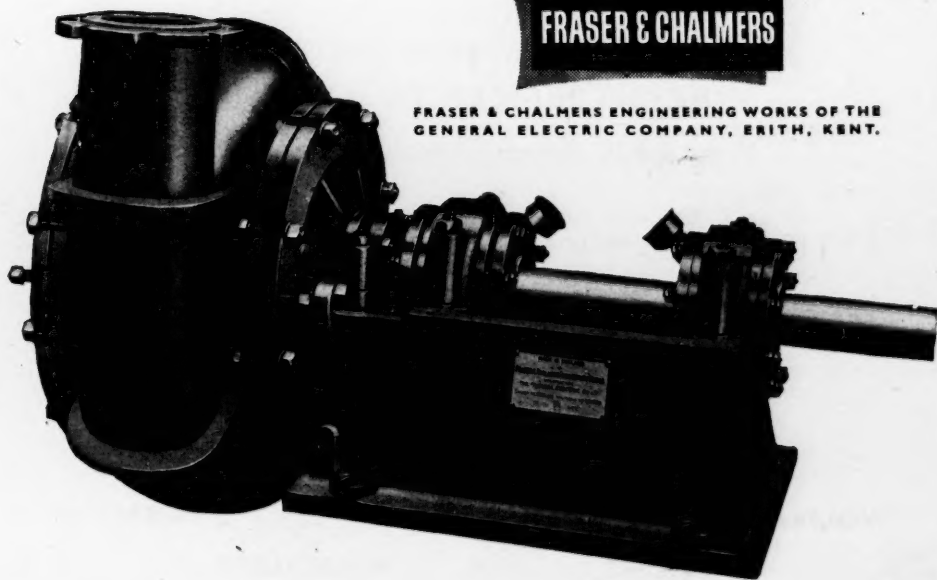
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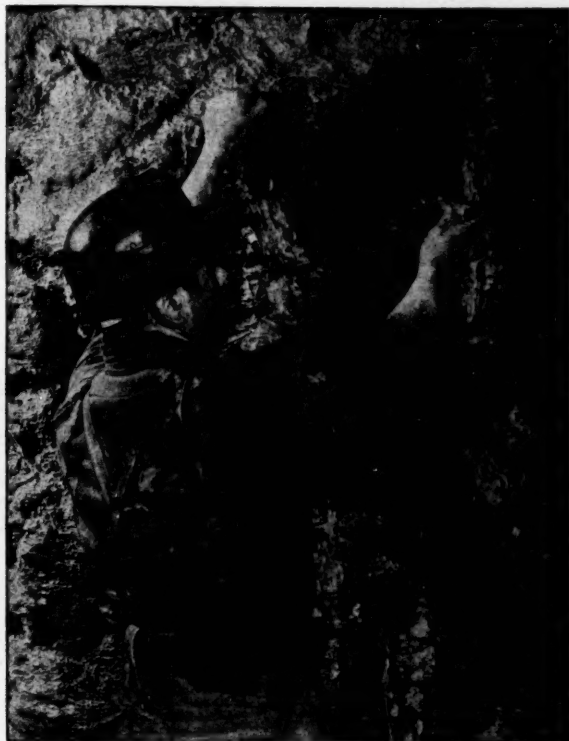
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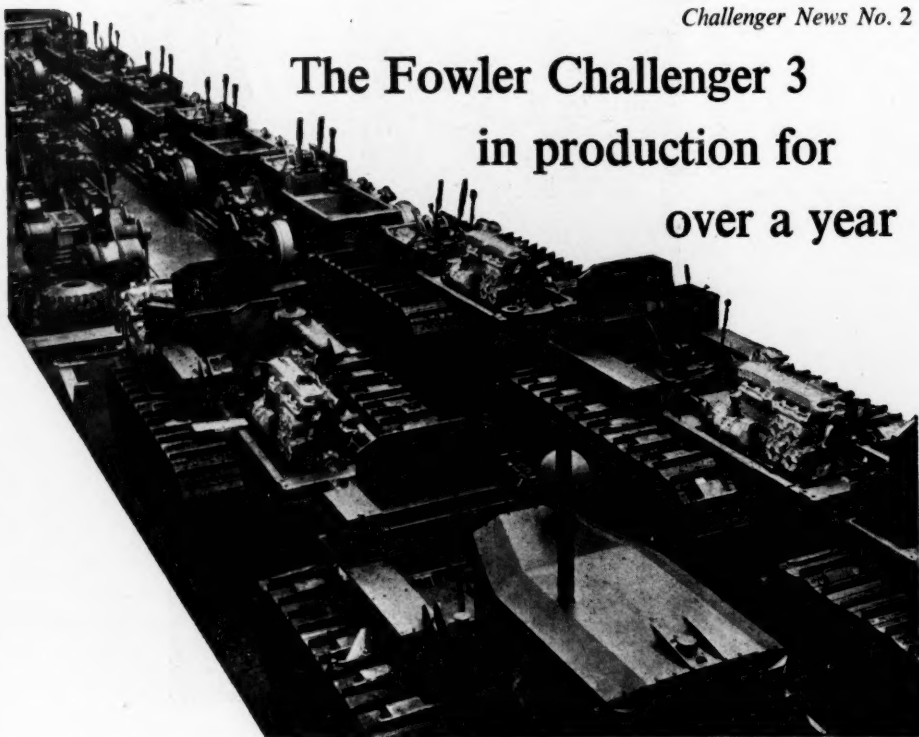
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NOTES AND COMMENTS

Eisenhower—Republican Candidate

Whatever the result of the forthcoming U.S. Presidential election in November may be, the choice of Mr. Eisenhower as the Republican candidate for the Presidency gives the assurance that the United States' vast plans to buttress Western economy will not be departed from. There have been many speculations since the war as to whether the United States would rise to the full height of her financial and economic ascendancy and recognize that materially as well as morally the position of the world's creditor nation carries with it responsibilities as well as economic franchise.

Thus far President Truman and the Democrat Party have blazed a trail of world economic development on a scale not incommensurate with the needs of the times, not merely in the sphere of Western rearmament to meet the threat of Communist world domination, but also to sustain the burden of raw material supply and so render possible the economic progress indispensable for the maintenance of the western way of life. This broad and liberal policy is now assured of continuity, whether the next U.S. administration be Republican or Democrat. The completeness of Mr. Eisenhower's triumph in the first ballot at the Chicago convention signifies the general support of American opinion for the policy of co-operation with the rest of the Free World for mutual security—economic as well as military—to which the Democrats are already pledged. Before the Convention was held American isolationism was becoming clamant through the utterances and actions of Senator Taft, General MacArthur, ex-President Hoover and other prominent Republicans. Now the world generally is reassured and we shall not have to wait till November 7 to know whether all the many vital programmes now being incubated must be put into cold storage.

For the mineral industry the decision is of special importance. Nothing has been conceived before on a scale comparable with the American plans for the search for and exploitation of fresh mineral resources throughout the world—plans calling for the expenditure of billions of dollars. Our issue of July 4 last, giving details of some of those schemes already in progress, provides some indi-

cation of what may be to come under the centralized direction of the Defence Materials Procurement Agency. More arresting still is the report of President Truman's Materials Policy Commission—the Paley report, as it has been christened—which in five months has compiled studies of probable demand and supplies over the next 25 years for the strategic minerals and metals together with the technological advances to be looked for. This report initially noted in our issue of June 27 has just been published in five volumes and as these become available over here, we shall hope to deal with the more important materials and problems involved. It may well prove a blue print of the future of mineral development.

The 40-Hour Week—Australian Mining Industry's Greatest Calamity

The greatest calamity that has fallen on Australian industry in recent years is the 40-hour week, which has now been in operation for four years, and which influences not only mining, but all other industries upon which mining is dependent, writes our Australian Correspondent.

The great argument advanced for the necessity of a 40-hour week was the catch cry of "fatigue" and the contention that given a shorter working week, efficiency would be greater and output increased. The result in many trades has been a great impetus to week-end work on contract, or at heavy penalty rates—fatigue being forgotten—and the proceeds of such work can be readily hidden from the tax gatherer. To the imposition of a 40-hour week can be directly attributed the growing shortage of commodities and supplies, and their steeply rising costs, together with the fantastic advance in wages in consequence of the rising cost of living. The evil has been accentuated by a slackening of effort and a reduction in efficiency, and it is very doubtful if the actual productive effort, particularly underground, exceeds 65 per cent of the time for which the employer pays. The aim of the worker is to reduce still further the output in work for which he receives increasing return under the Arbitration Awards; in the last Union log presented to the mining industry in the Eastern States was a claim—very properly refused—for a tea break of 15 minutes, both before and

after the "crib" break of 30 minutes at mid-shift, making 60 minutes in the seven hour underground day, irrespective of the time getting to and from the working place, "smoke-ohs" and other rest periods taken during the shift.

The position has been well summed up by O. H. Woodward, in his presidential address to the Australian Mines and Metals Association: "... The 40-hour working week should be in reality and not merely in name and form a forty-hour week. There is to-day in industry generally a widespread and damaging tendency to whittle away the corners from the 40-hour week by late starts, by early finishes, and by unnecessary and unjustifiable breaks for various purposes during the working period. This light hearted and irresponsible approach to industrial duty, which is perhaps due as much to thoughtless indifference as to any planned attempt to retard output, can and will in the long run react to our general disadvantage and it will certainly have unpleasant repercussions also on those who are at present taking their tasks so lightly. If the 40-hour standard working week is earning for itself a bad reputation as the chief single factor in slowing up the nation's productive campaign, and if by increasing costs of many essential goods it is, or is said to be, adding fuel to the flame of inflation, it is because it is not being given a fair trial by some of those whose representatives worked so hard to obtain it. In this country, where opportunity knocks at everyone's door, a fair and honest day's work for a fair and honest wage is a pre-requisite to progress and prosperity."

The fruits of the policy of short hours, high wages and low and inadequate return are rapidly ripening, and the harvest will be the result of labour's own sowing. Two instances clearly show the effect of the trend over the past four years, for which the 40-hour week is mainly responsible. Costs at the Great Boulder Pty. Gold Mine, Western Australia, have risen from 48s. 7d. per ton in 1949 to 64s. 11d. in 1951. In New South Wales, the f.o.r. costs of open cut mined coal, from nine collieries, ranged from 55s. 11d. to 81s. 6½d. per ton; the cost of hauling this coal by rail to Sydney, the maximum distance being 179 miles, varied from 21s. to 43s. per ton. Coal is the basic essential of all industries, and these production and transport costs show very strikingly the initial effect of a 40-hour working week before the production and manufacturing costs of the secondary industries themselves have been added to the total cost which must ultimately be borne, directly or indirectly, by all industry.

New D.M.P.A. Order Stimulates Columbite Production

The continued pressure of demand for columbite, which is widely used in the manufacture of gas turbines and jet engine components, foreshadows a prosperous outlook for Nigerian producers of this ore as that country is currently supplying about 95 per cent of the world's requirements.

In fact, the United States Government's need for this metal is such that to meet the requirements of its armament and industrial programmes, the Government recently introduced a new pricing basis for the metal. This new pricing basis, which has been announced by the Defense Materials Procurement Agency (D.M.P.A.) in an Order dated May 28, 1952, is designed to establish a guaranteed purchase programme to encourage the expansion of the production of columbium-tantalum bearing ores and concentrates in countries of the free world.

At present the Nigerian producers are obtaining approximately 320s. per unit equivalent to £1,040 per ton consisting of 65 units to the ton. Under the new arrangements, D.M.P.A. is prepared to pay for columbium ores and concentrates containing not less than 35 per cent

combined $\text{Cb}_2\text{O}_3/\text{Ta}_2\text{O}_5$ in a ratio of not less than one to one, \$1.40 per lb. plus 2c. per lb. for each additional full per cent above 35 per cent. Under this arrangement columbite producers receive a price geared to the quality of their ores instead of, as formally, a fixed price per ton regardless of whether the ore was high-grade or low-grade.

Thus, working in 1 tons and taking as our conversion factor 7.15s. to the dollar, the basis for payment per unit of columbium-tantalum bearing ores containing 50 per cent combined Cb_2O_3 and Ta_2O_5 would be 272s. per unit, while the price for ores containing 65 per cent would rise to 320s. 6d. and to 324s. per unit for ores containing 70 per cent—subject to penalties for impurities.

This arrangement would by itself be sufficient to stimulate production, but so urgent is the need for this metal that the new U.S. Order provides for an incentive bonus amounting to 100 per cent on the foregoing prices. Therefore, columbite producers will receive 544s. per unit for 50 per cent columbium-tantalum bearing ores, 641s. for 65 per cent and 648s. for 70 per cent. This bonus will not, of course, be paid on any lot previously owned by the U.S. Government.

The chief Nigerian columbite producers whose shares are quoted on The London Market are Amalgamated Tin Mines of Nigeria, Jantar Nigeria, Bisichi Tin, Naraguta Tin, Ex-Lands Nigeria and Gold & Base Metals. Of these companies Amalgamated Tin Mines and Jantar are the two leading producers.

Before the introduction of this order a definite figure for the price of columbite was almost impossible to obtain at any particular time as the mineral was usually sold on short-term contract and the price was subject to considerable variation. Now, however, with the United States prepared to purchase a minimum of 15,000,000 lb. under this new Order, based on the pricing arrangements quoted above, a world price would appear to be established for the various grades of columbite for some time to come as this total offtake is equivalent to approximately seven years' world supply at current rates of production.

While the terms of reference of this order were designed to stimulate production, there is little evidence to hand to suppose that, outside of Nigeria, there is much opportunity for a large expansion in production. Columbium is not only widely used in the manufacture of gas turbines and jet engine components, it is also used extensively as a carbide stabilizer in stainless steels, in electrodes for welding stainless steels, and in the manufacture of special magnetic alloys and chemical equipment.

Geological Surveys in Canada

Mr. G. Prudham, Minister of Mines and Technical Surveys, Canada, has announced that a total of 77 parties will be placed in the field this year by the Geological Survey of Canada. This shows a decrease of 11 parties over the quota for last year, and emphasizes the shortage of geologists mentioned by the Hon. W. S. Gemmel, former Minister of Mines, Ontario, in a note in *The Mining Journal* on May 16 this year. Despite this shortage, however, extensive programmes of geological investigations and mapping projects are proposed in all provinces as well as in Yukon and North-west Territories.

Geological reconnaissance by helicopter is to be used by five geologists, with supporting aircraft, over 100,000 sq. miles. The area bloc includes territory west of Hudson Bay towards Great Slave Lake and northwards from the southern boundaries of North-west Territories. The area concerned thus lies entirely within the Canadian Shield, and mostly in the Barren Lands.

Australia

(From Our Own Correspondent)

Melbourne, July 1

There seems to be a very marked lack of co-ordination between Government departments and Government objectives. It has become so urgently apparent that production must be increased that Government investigations are being made into this and that branch of primary production to find the cause of declining production and how output may be stimulated. But hard facts seem to be brushed aside if they conflict with favourite theories. There is, and has been for some time, a definite urge to produce more coal, more tin, and more of other metals and minerals in short supply. But always, the obstacle is taxation.

The coal mining industry is a case in point. Mechanization is urged as a means to greater output. A shareholder is entitled to a fair return on his capital, but the return from coal mining investments is inadequate to compensate the risks involved; consequently shareholders will not provide the increased capital for mechanization. Therefore, equipment is being bought with public money and being made available to mining companies on appropriate terms. Two cases may be given as typical. Bowen Consolidated Coal Mines has distributed 40 per cent on the paid capital, which in 33 years represents 1.21 per cent per annum on subscribed capital, or a return of 7½d. per ton of coal produced. This case is typical of many and clearly shows the unattractive nature of the investment. The second case is that of the large organization, Caledonian Collieries Ltd. capable of responding well to mechanization. This company has just paid the dividend on Preference shares for the year ended December 31, 1938, leaving arrears of preference dividend amounting to £A.301,792. Yet provision for taxation on income for the year ended December 29, 1951, amounts to £A.136,100. Apart from the total destruction of incentive, it would seem far more to the country's interest to reduce taxation drastically so that the money involved could be applied to increased coal production.

Under the present system, one Government organization buys and is prepared to make available coal mining equipment which must ultimately be paid for by the user, while the taxation authorities, at the same time, remove from many companies, all inducement to incur any liability additional to those under which they now labour.

COPPER DISCOVERY MAY BE IMPORTANT

It is reported that a discovery of copper that may be of importance has been made 40 miles south of Marble Bar. Information is that costeaning (systematic trenching) already done indicates a lode of 100 ft. wide over a length of 2,000 ft.; assays are reported to show ore worth 20 per cent copper, and a parcel of 16 tons sent to the works of the Electrolytic Refining and Smelting Co., at Port Kembla, New South Wales, assayed 40 per cent copper. Such reports are naturally viewed with caution, but following a recent inspection, Anglo-Westralian Mining Proprietary, an offshoot of Mount Isa Mines and Big Bell Mines, has taken an option over two mineral leases, and the Mines Department has granted the discoverers a temporary reserve of 600 acres for further prospecting. The State's two copper fields, of one-time importance, are Whim Well, near Balla Balla on the north-west coast, and Ravensthorpe, on the south coast.

The two centres of activity in exploration for uranium are Rum Jungle, in the Northern Territory, and Radium Hill, in South Australia. The Radium Hill deposits are being developed by the South Australian Government, and in future work financial assistance will be given by the

Commonwealth Government. Work by the State has been in progress since 1946, and at Radium Hill has indicated that the deposits warrant the sinking of a main working shaft and its equipment, preparation of the mine for continuous production, and the erection of a concentrating plant, which research to date indicates will combine heavy media separation, magnetic separation, and flotation. This productive stage will be followed by the chemical processing of the concentrate in South Australia. The Department of Industry, South Australia, is building up a large research staff for investigations, plant design, construction and operation. A chemical research section of the Department of Mines is to undertake research into the extraction of uranium, development of analytical methods, and improvements in methods of extraction.

Mines of the Congo

(From Our Own Correspondent)

Brussels, July 14

This is the season at which the mining companies in the Belgian Congo issue their annual reports. First we have had that of the Union Minière du Haut Katanga, which is the outstanding company in the Congo, not only because of the variety and importance of its mineral output, but also by virtue of its achievements in the field of social welfare. This however, should not be taken to mean that Union Minière alone is fulfilling its obligations towards its native labour. In fact, the other mining companies are all doing good work although naturally on a lesser scale. Summaries of the Union Minière's report, and of Monsieur Edgard Sengier's address at the recent annual meeting have already appeared in *The Mining Journal* of June 27 and July 4.

DIAMONDS

Also in the Société Générale de Belgique group, is the Forminière, the big diamond producer, which last year worked 40 prospects in the Kasai River basin producing 389,000 ct. against 361,000 in 1950—principally in gemstones. The discoveries made in 1951 more than compensated for the production offtake, leaving the reserves at the end of last year somewhat higher than a year previously. Thanks to steadily increasing rationalization and improved mechanization, the Forminière was able to reduce its native labour force during the year.

Indeed, rationalization and mechanization are to-day the watchwords of all the Congo companies, as the Colony's native population is not large, being only 4.83 inhabitants per sq. kilometre. For the same reason the Forminière, like all the Congo companies, is giving free medical service and free education, not only to its employees, but also to all other natives in the district.

The other big Congo diamond company is the Minière du Bécéka, with a production which consists almost exclusively of industrial diamonds. Last year the company had an output of 10,027,000 ct. against 9,604,000 in 1950. These came from nine workings, located in the basin of the Lubilash River which is the name for the upper reaches of the Sankuru River. Prospecting carried out last year resulted in an increase in the company's reserves, in spite of their record output. Drilling during the year resulted in the location of the principal mass of the Kimberlite fissure and has proved an extension in depth of the primary formation. Like the Union Minière and the Forminière, the Minière du Bécéka also belongs to the Société Générale de Belgique. Parenthetically it is only right to point out that if the Société Générale owns so much of the Congo to-day, it is only because in the early days of the Colony it did not hesitate to accept very con-

siderable risks in what Stanley had termed "Darkest Africa."

TIN

Another company which has now published its report for 1951 is Symétain, the second largest of the Congo mining enterprises, as Monsieur Henri Depage, one of its two managing directors, was able to claim with some pride at the recent celebration of the company's twentieth anniversary. Symétain is not in the Société Générale group, but was created, following on the Symaf discoveries, by three Belgian concerns, the Synkin, the Cominière and the Banque de Bruxelles. The company is under the technical direction of Monsieur Raymond Anthoine. Last year Symétain produced 5,109 tonnes of cassiterite, containing 3,849 tonnes of tin metal against a 1950 output of 4,521 tonnes of cassiterite containing 3,410 tonnes of tin. Symétain is the biggest tin producer in either the Congo or Ruanda-Urundi and last year also had a production of 106 tonnes of wolframite as against 27 tonnes in 1950.

At the present time the Congo's second largest tin producer is Géomines, about which your correspondent wrote recently, in your *Annual Review* regarding the com-

pany's increase in capital from Frs. B.200,000,000 to Frs. B.700,000,000 required to work the tremendous new cassiterite deposits discovered under its present workings. Last year Géomines produced 4,300 tonnes of cassiterite.

GOLD

Turning to gold mining—one of the main products of the Congo—the Colony's chief producer, Kilo-Moto, last year had an output of 218,500 f.oz. against 204,000 f.oz. in 1950. Output in the first half of the current year amounted to 125,400 f.oz. against 105,800 f.oz. in the first six months of 1951. Proved ore reserves at the end of 1951 remained practically unchanged from the previous year. Drilling carried out during 1951 revealed good mineralization both in the Kilo and Moto sections of the property. Increased mechanization enabled the company to reduce its native labour force from 26,062 in 1950 to 23,444 in 1951. The company maintains 155 schools, and educates some 7,500 boys and 4,500 girls.

The Congo's second largest gold producer is the Minière des Grands Lacs Africains, which in 1951 produced 75,400 oz. of unrefined gold against 70,300 oz. in 1950.

Export of Capital from U.K. to Canada Increasing

(From Our Own Correspondent)

Timmins, July 3

Gold production in Canada continues to decline, but there is increasing hope that better days are near at hand for the industry. At the prevailing price of \$U.S.35 for an ounce of gold, there is an increasing tendency for the flow of newly produced gold to find its way into the hands of private purchasers. A little more than a decade ago when the governments of the free world were producing the precious metal at a rate of \$100,000,000 a month, the governments of the free world were buying about 75 per cent of the output. In sharp contrast is the revised report of the International Monetary Fund which shows only \$125,000,000 purchased by these same governments for the entire year 1951. Indeed the preliminary estimates for recent months have suggested a decline to zero—with private purchases exceeding current world output and with the treasuries of the countries of the free world actually losing gold at a rate of more than \$10,000,000 per month. With eyes turned toward this trend, there are many capable observers who believe the time may not be far off when the necessity will arise for linking gold more definitely to the monetary systems of free nations—and a return to sound money, that is a money convertible into gold.

IS U.K. CAPITAL COMING IN BY THE BACK DOOR?

There is growing evidence of an increase in investments of British capital in Canadian industry and enterprise. There is general comment regarding this trend, and there is considerable newspaper publicity. However, brokers and financiers are reluctant to reveal the identity of the participants. It is well known that the British Treasury exercises a tight rein on capital investments abroad. Individuals who desire to transfer capital from England to Canada are finding it difficult to do so in anything more than trifling amounts. However, it seems obvious that ways and means have been found to meet such restrictions to considerable extent.

Many Canadians are coming to believe the monetary ills of the world will continue until such time as free convertibility of paper currency into gold becomes re-

established—and that by doing so the life insurance policies and the savings of individuals will again be protected by a sound and reliable currency. It is felt to be a great pity that capital cannot flow freely between England and Canada. No other capital is more welcome in this country than that of the British investor. And it is a matter of regret and deep concern that British capital is not free to participate in the industrial expansion taking place in Canada. For instance, it would be difficult to overestimate the impact on the future history of the Commonwealth were British capital able and permitted to establish steel mills in this country to process the tens of millions of tons of iron which is destined to be mined annually from broad mineral lands in this country—the processing and fabricating being done in Canada on a basis of \$80 per ton for a finished product rather than the export of raw material on a basis of \$8 per ton.

CONVERTIBILITY MEANS HIGHER GOLD PRICE

But, to establish conditions under which free convertibility of paper currency into gold on a world-wide scale would become feasible, might well entail the necessity for production of increasing quantities of gold. And, to create conditions under which greater output of gold could be established on an economic basis would entail an increase in the fixed value of gold—that is if anything like the present high level of commodity prices and wages is to be maintained. Therefore, if such reasoning be correct, the first step would be to increase the price of gold. This would automatically make it possible to mine vast quantities of ore which under \$35 gold is too low grade to be of economic value. The opinion prevails that if gold were doubled in value to \$70 an ounce, the amount of gold that could be mined economically would not merely be doubled. The truth is that it would be multiplied in volume. For each ton of ore that may be profitably mined under gold at \$35 an oz. there would probably be ten tons raised to the level of economic value under \$70 gold. Not only that, but there would be the incentive to search for and develop new deposits—all this serving to spearhead progress into undeveloped sections of the world.

COLONIAL MINERALS DEVELOPMENT—XI

Mining in Fiji

By A. G. THOMSON

In the following article, the eleventh in a series devoted to the mineral wealth of the smaller British Overseas Territories, the author tells the history of the gold mining industry in Fiji and mentions current prospecting activities.

The British Colony of Fiji comprises more than 300 islands, about 100 of which are inhabited. These islands are scattered over about 90,000 sq. miles of the South-West Pacific Ocean between latitudes 16° and 22° south of the Equator. Their total land area is little more than 7,000 sq. miles, of which the island of Viti Levu accounts for more than half. Suva, the capital of the Colony, is 1,980 statute miles by air from Sydney, 1,325 miles from Auckland, 3,183 miles from Honolulu, and 5,611 miles from San Francisco. The larger islands have volcanic origin.

Mining in the Fiji Islands has so far been confined to gold, which plays an important part in the economy of this Colony. Gold mining was first undertaken in the Yanawai district (Mount Kasi) of Vanua Levu, where it was carried on regularly on a small scale for many years. About the end of 1933 an old prospector, William Borthwick, found interesting gold indications in northern Viti Levu. The engineers who first examined the field found an unusual formation and were not optimistic. Nevertheless, Borthwick and his backer, a Suva merchant named Costello, refused to lose faith in their prospects, and eventually succeeded in persuading a Melbourne syndicate to make investigations. These were carried out under the direction of Dr. Loftus Hills, a well-known mining and geological expert. Dr. Hills discovered the existence of a very large goldfield at Tavua and much money was spent by the syndicate in preliminary development, which led to the discovery of the Emperor Mine.

By the middle of 1935 there was an intense activity in the Tavua field, where the Emperor Mine had reached the production stage, and a number of smaller companies were engaged in development work in the immediate vicinity of the Emperor lease. Some experts believed that the new field would be as rich as Kalgoorlie. The progress of the industry was hampered, however, by a wave of frantic speculation in Fiji gold shares on the Australian stock exchanges. The Fiji Government did its utmost to



The Emperor open cut, showing benches and electric shovel

discourage wild-cat enterprises connected with the Tavua field, but was unable to curb the enthusiasm of company promoters in Sydney and Melbourne. Meanwhile the gold industry on Vanua Levu was making progress.

From 1,926 f.o.z. in 1934, the production of gold in Fiji rose to 92,362 oz. in 1938 and 111,368 oz. in 1940. During the war, however, serious difficulties were encountered by the principal mining companies. Restriction of development work led to a progressive decrease in ore reserves, while scarcity of mechanical spares caused difficulties at the treatment plants. In 1949, output at 104,000 oz. was almost as high as the peak pre-war level, but last year it declined to 94,000 oz.

Active mining operations on a large scale are confined to three mines in the Tavua goldfield, namely the Emperor, the Loloma and the Dolphin. Production during 1950 was:

	Long tons milled	Gold (oz.)	Silver (oz.)
Emperor	138,786	56,571	20,631
Loloma	20,480	22,980	9,277
Dolphin	13,946	23,843	7,828

At the end of the year the Emperor had ore reserves of 985,000 tons averaging 7.9 dwt. per ton, the Loloma 48,000 tons averaging 20 dwt., and the Dolphin 35,000 tons averaging 25 dwt.

Prospecting has been continued since the war without disclosing any spectacular occurrences of either precious or base metals, but some 700 tons of manganese ore were mined in the Nandi district during 1950, 200 tons of which were exported to Britain. A provisional scheme for stimulating prospecting and mining development in the islands has been announced by the Mines Department.

Fiji's Geological Survey only started operations within the past twelve months, but the gold mining companies have employed geologists for many years, so that the geology of their own concessions is well known. The Survey has a staff of two geologists, by whom the potentialities of the manganese will no doubt be explored.



A stope in the Emperor Mine. At right are crib sets of timber

TITANIUM—I.

Titanium—Its Occurrence and Uses

By GRAHAM OLDHAM, B.Sc., F.R.I.C., D.L.C., M.Inst.F.

Until the introduction of the Kroll process of extraction the use of titanium other than in a powdered form, was severely curtailed. But this process made the working of titanium metal a commercially practicable proposition and to-day its uses militarily and industrially are manifold. Since it is estimated to be the fourth most abundant metal present in the earth's crust, scope for its utilization in the future appear almost limitless. In the following article the sources and uses of titanium are dealt with and in a concluding article the author will give details of both the treatment and production of the metal.

British interest in titanium dates back to its discovery in 1791 by the Cornish parson William Gregor who named it Menachanite. It was however subsequently "rediscovered" by the German analyst Klaproth who renamed it titanium after the Titans of Greek mythology. Although a considerable amount of its chemistry was investigated during the 19th century, it only began to find use as a pigment about 1900. Since then, titania has become increasingly used in this field. The most important advances however have occurred within the last few years and titanium is now of great potential importance as the metal itself and in the form of its alloys. This is due on the one hand to the introduction of the Kroll process of extraction, developed under the auspices of the United States Bureau of Mines, and on the other to the increasing demand for the metal and its alloys in the armaments industry. Titanium is frequently classed as a rare metal, but its rarity in the past has been due solely to the difficulties of its extraction. It is, in fact, estimated to be the fourth most plentiful metal present in the earth's crust.

TITANIUM MINERALS

The most important ores of titanium are ilmenite, arizonite and rutile. Less common are anatase, brookite, titanite and perovskite. Ilmenite is a ferrous titanate ($\text{FeO} \cdot \text{TiO}_2$) containing about 53% TiO_2 and arizonite a ferric titanate ($\text{Fe}_2\text{O}_3 \cdot \text{TiO}_2$) containing about 60% TiO_2 . Rutile, on the other hand, is an oxide ore (TiO_2) and therefore commercially very desirable although it is, in fact, much less common. Titanium minerals are to be found in both primary rock deposits and also in secondary sedimentary deposits.

PRIMARY DEPOSITS

Ilmenite in primary deposits generally occurs as a result of the magmatic segregation. Such deposits are being worked, in the main, only in America and Norway. In most of these primary deposits ilmenite occurs in close association with magnetite or haematite. The iron oxide and ilmenite in some cases are quite distinct and may be separated by normal mineral dressing techniques. In other cases, however, such as the titaniferous haematites, the two metals cannot be separated except by a pyrometallurgical process in which pig iron is produced together with a titaniferous slag, titanium being subsequently extracted from the latter.

The world's largest exploited primary deposit at the moment is the MacIntyre Development, Tahawus, N.Y., belonging to the National Lead Co. According to Milliken¹ the ore consists of magnetite 37%, ilmenite 32% and siliceous gangue 31%. The ore is crushed, with the removal of non-magnetic tailings, and it is then rod milled to 28 mesh. The magnetite is then removed from the ground ore and the tailings are classified. The head product is tabled and the slimes adjusted to pH 6.5 with sulphuric acid. They are then floated using oleic acid, fuel oil and sodium fluoride when a concentrate containing 46% TiO_2 is obtained.

The second largest production of primary ore is at Flekkfjord in Norway. The ore here is located in a large

dyke of gabbro 5,000 ft. long and 150 ft. thick and is enclosed in a large mass of anorthosite.

Extensive primary deposits also occur in North Carolina. Those in the Yadkin valley appear as a replacement in a gneiss rock and contain both ilmenite and rutile in a mica-containing gangue. A large deposit opened about six years ago in Caldwell County yields an ore containing 70% ilmenite in the form of crystals 0.3 x 0.4 mm. in a soft sericite talc and talc-serpentine gangue. In this case no rutile is present. According to L. L. McMurray² either fatty acid-alkali or amine-acid flotation can be used here to produce a concentrate showing 53% of TiO_2 . Other primary deposits occurring in the U.S.A. are the Piney River deposit in Virginia, operated by the American Cyanamid Company, and the Roseland deposit in Virginia operated by the American Rutile Company.

Titaniferous iron ores which are not amenable to normal ore dressing methods occur at St. Paul, Quebec, and also in the Allard Lake area. The reserves here are estimated at 150,000,000 tons and it would certainly appear that this area in North America is becoming of extreme importance as a producer of titaniferous ore.

Titaniferous ores occur as magmatic segregations in the basic rocks of the Bushveld Complex in South Africa. The predominant minerals are magnetite, ilmenite, haematite and maghemite, the ore reserves being estimated at 2,000,000,000 tons. In part of the ore the ilmenite is predominantly granular and may possibly be concentrated physically but in the remainder of the ore, physical beneficiation would be impossible.

SECONDARY DEPOSITS

Secondary deposits in the form of placers, sediments, etc., are quite widely distributed due to the high specific gravity and the resistance to weathering of titanium ores. They are largely found in the form of black beach sands, particularly important being the monazite deposits at Travancore, Southern India. Although these deposits have been known and worked for a considerable time it was not until 1924 that an attempt was made to recover the ilmenite occurring therein. In addition to the well known Travancore deposits, new secondary deposits are now being exploited about 80 miles north of the older workings.

Originally regarded as the most important producer, the uncertainty of the supply position during the early years of the war was undoubtedly a major contributing factor in the great expansion of American production. Secondary deposits are being worked in Florida where there are four beach type deposits of black sands. These deposits are quite extensive, the one near Jacksonville, for example, producing over 7,000 tons of sand per day. The deposits at Trail Ridge, Florida, have been described by R. V. Spencer³. These cover an area 45 miles inland from the East coast of North Florida. Rutile ilmenite and zircon are all found in siliceous sands which the author suggests have been transported from the Piedmont area by ocean currents and streams. The heavy sands contain some 54% titanium minerals and are amenable to flotation in acetylene tetrabromide followed by magnetic treatment of the heavy portion.

A number of beach sands containing rutile and ilmenite occur in Australia and are being worked in both Queens-

land and New South Wales. The concentration is achieved by tabling, magnetic and electrostatic separation and flotation. Deposits also occur in the form of magnetic iron sands in New Zealand, west of Wanganui. According to C. A. Fleming⁴ these comprise extensive Pleistocene deposits under recent beach and dune sands and also under farming land. Two deposits in this area are estimated to contain 200,000,000 and 20,000,000 tons of titanomagnetite respectively.

Deposits also occur in South Africa. The Natal coast sands contain an average heavy mineral content of between 4 and 8% of which 70-85% is ilmenite. Ilmenite has been reported in the Swakopmund coastal sands but these deposits have not been accurately surveyed and in any case there are difficulties in the way of their exploitation, one such being the lack of fresh water. Generally speaking, the bulk of the ilmenite here lies in the 100-200 mesh range and therefore a partial preliminary concentration could be achieved by classification. Further separation would then be possible with jigs or tables followed by the magnetic separation of the magnetite and ilmenite. Zircon which is present could be separated electrostatically in the non-magnetic fraction. It should be pointed out, however, that at the moment production of titanium products in South Africa is relatively only small.

This survey of titanium deposits is by no means complete. In addition to those which we have mentioned, ilmenite is also to be found in Malaya, Ceylon and Peru, and rutile in Brazil and the French Cameroons.

THE USES OF TITANIUM

(a) *Military*.—Although it is not proposed to deal here with what may be called the post-extraction metallurgy of titanium, it may be of interest to consider briefly some of its uses. Undoubtedly one of the chief reasons for the present interest shown in the metal is its importance from a military point of view. This is due in turn to some of the abnormal properties which it possesses. It is, for example, extremely resistant to corrosion by sea water and it is therefore potentially very important from a naval point of view. It may ultimately find use for pipes carrying salt water, for water lubricated and antifriction bearings operating in salt water and for small high speed propellers.

Its potential applications in aircraft are also very numerous. The production of elevated temperatures in aircraft structures is becoming more common due, for example, to the effects of the jets and afterburners in jet aircraft and although the light alloys which have been produced up to now show signs of weakening at between 300° and 400° F., titanium and its alloys are very satisfactory for moderate temperature service both from the point of view of corrosion resistance and lightness.

Titanium also finds a place in equipment designed for the army. Its lightness and high strength-weight ratio make it eminently suitable for girder work in the construction of portable bridges and for air-borne equipment generally. A large number of other military uses such as the production of armour plate, truck bodies, etc., readily suggest themselves.

(b) *Industrial*.—The use of ferrotitanium as a scavenger and ferrite former, and the application of titanium in the production of alloy steels is well known. It is of particular value in austenitic stainless steels in which it prevents intergranular corrosion and stabilizes the carbon content. Its high affinity for oxygen which we have already mentioned renders it extremely valuable as a deoxidizer. Its affinity for sulphur renders it capable of converting ferrous sulphide in a melt to titanium disulphide, the action being similar to that of manganese and it also prevents hot

shortness due to sulphur in low-carbon steels. The carbides of titanium are very hard and find use in cutting tools. Added to aluminium alloys it has a grain refining action and with copper or nickel it gives strong age-hardening alloys. Its use in Monel metal helps to eliminate porosity and it is also used in Inconel X which possesses a high fatigue limit in alternating torsion at elevated temperatures.

These metallurgical uses constitute but a few of the very numerous applications to which titanium alloys may be put and readers who are interested in the present and potential uses of titanium and its alloys are referred to the papers presented before the Division of Industrial and Engineering Chemistry at the 116th Meeting of the American Chemical Society and published elsewhere⁵.

(c) *Non-Metallurgical*.—Reference has already been made to one of the major uses of titanium as a pigment. It is of particular importance for this purpose due to its intense whiteness, extremely good covering power and opacity, and also because it shows a wide variety of grain structures. A further advantage is that it is non-poisonous and does not blacken under the action of sulphur compounds as does white lead. Barium titanate also finds use for this purpose. The extremely good reducing properties of titanous compounds renders them very valuable for dyeing and colour printing in the textile industry. Titanium potassium oxalate (T.P.O.) is also widely used in the dyeing of leather. More recently, the tetraalkyl orthotitanates have proved to be very effective waterproofing agents and are capable of rendering cotton, wool, rayon, paper, and wood, water repellent. Within the last four or five years, titania has found use as a major opacifying agent in porcelain enamels. Titanium dioxide has been used in ceramic capacitors since about 1930, but in 1940 it was found that barium titanate was superior in this respect since it has a higher dielectric constant. Subsequently, other titanates have been used and are becoming increasingly important. Polarized polycrystalline barium titanate also shows piezoelectric properties and since, unlike piezoelectric quartz, it can be preformed into any desired shape, it will undoubtedly become important in the industrial applications of ultrasonic energy.

COST: THE LIMITING FACTOR

Whilst many non-metallurgical uses of titanium compounds ensure a steady demand for these materials, the position with regard to the metal itself is somewhat different. The limiting factor here is one of cost, which at present is phenomenally high. There is, however, little doubt that as production increases the cost will fall rapidly. The increase in production can be gauged from the fact that one company, Titanium Metals, jointly owned by the National Lead Co., and the Allegheny Ludlum Steel Corporation, aims to produce 3,600 tons of titanium annually, against the present world total of about 500 tons. Much of this amount is produced by Du Pont and they, in turn, propose to considerably increase output. This general increase in production, to which numerous other organizations will undoubtedly contribute will ensure that titanium occupies a prominent position in the metallurgy of the future.

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Modern Mine Signalling

Effective signal measures between shaft bottom and winding house are an essential in the preservation of output efficiency and the lives of workers in the mining industry. In the following article, the designs of J. A. Strong patent apparatus made by the Clay Cross Co. Ltd. are presented as worthy of attention.

Of interest to mining engineers are the latest designs of J. A. Strong patent mine-signalling apparatus made by the Clay Cross Co. Ltd. Essentially this is operated on the simple "pull-wire" mechanical principle, giving the signal in the engine house from the pit bottom in three different ways: (1) by indication, (2) by illumination and (3) audibly by means of a bell, a one-dial apparatus only being used, fixed on a cast iron pedestal in the engine house, the whole apparatus fulfilling the requirements of the British Coal Mines Regulation Act.

Some of the chief characteristics are robust construction, simplicity of design, and accessibility, so that repairs can easily be carried out on the spot by the ordinary colliery

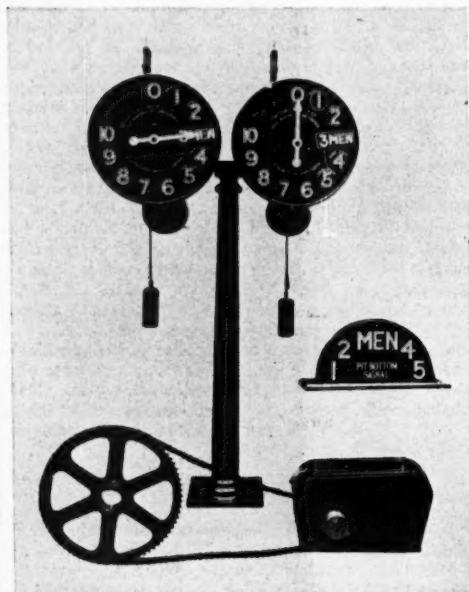
indication of the signal apart from the audible one. With Strong's system, however, if the lamp fails the finger will still indicate the signal that has been rung as well as ringing the bell once, twice, or three times, as the case may be. Further, the apparatus does not return to "zero" until the engine has started and it is impossible for the bell to ring a signal without the number being indicated by the finger on the dial or vice versa, whilst the correct signal is registered whether a long or short pull is given.

A SAFETY FACTOR

In connection with the winding of men, the indicating finger on the dial will point to signal No. 3 "men" which is then illuminated red and when the "right away" signal is given the finger returns to 1, indicating the last signal. The word "men" on the dial, however, remains illuminated until after the engine has started, making it impossible for the engine man to forget he is winding men. In any case he has only one dial to watch and therefore cannot make a mistake, whilst the man at the pit bottom has only one pull wire to operate so cannot pull the wrong wire and give the wrong signal in the engine house, as sometimes may obtain with indicators having two dials and two pull wires. Further, should the electric current be cut off through any cause the mechanical part of the signal apparatus is not affected and will continue to record correctly both visibly and audibly, any signal given. There is also supplied, if required, along with the apparatus, a pit bank indicator of the electric type only, the lamps being controlled from the signal dial in the engine house.

Finally, a recent improvement in the apparatus is the addition of an emergency stop signal and an "anti-over-pull" device to regulate the stroke of the pull-wire imparted to the pull rod of the signal. This consists of a piece of steel tube with a spring-loaded plunger attached to the rod which provides a cushioning effect after the pre-determined length of the stroke has been made. Another important feature is that the signal is now automatically tripped by means of a chain driven and otherwise mechanically operated trip gear driven off one of the live shafts of the winding engine.

Its equivalent in an electric set of signals is a cancelling switch which, however, in general is more delicate in character compared with the fool-proof and robustly made chain driven gear of Strong's design.



Mine signalling apparatus on the single pull wire mechanical principle

engine-wright. This is very important in view of the difficulties apt to be caused with maintenance and breakdown in some types of more complicated electrically operated mine signals on a solenoid impulse principle. The latter require a considerable length of electric cable affording easy opportunity for breakdown, whilst equipment depending on a series of relays which have to be very sensitive is apt to give trouble, due to the complicated nature, under severe operating conditions in the pitshaft, at the pit head, and in many winding engine houses, generally because of dampness. Under the latter conditions mechanical indication is not so liable to trouble, and the Strong equipment can conveniently be installed as a stand-by making use also of any existing pull-wire equipment.

It may be pointed out that electrically operated signals do not usually employ a clock type indicating finger, but merely have a series of ground glass windows which light up in conjunction with the ringing of the bell. Should one lamp fail behind the ground glass there is no

Mine Signalling in Precise

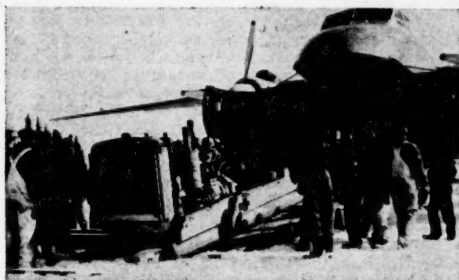
The various uses and installations of mine signalling equipment are of great importance in modern deep level mining. Efficient signalling apparatus from surface to shaft gate aids production and protects the lives of workers. Thus it is of considerable interest that a handbook giving details of the installation and maintenance of signalling systems for mine shafts has been published by the Automatic Telephone and Electric Co. The copy under notice is a second edition and contains five sections which in turn deal with apparatus, the A.T.M. mine shaft signalling system, mine haulage signalling systems, telephones, and standard adjustments for A.T.M. mine signalling equipment.

The publishers emphasize that the work should be read in conjunction with the relevant Acts of Parliament and with the Rules and Regulations of the Ministry of Fuel and Power. Well illustrated, this is a most useful handbook.

MACHINERY AND EQUIPMENT

Air Freight Transport for Mining Equipment

It was recently reported from Salmita Consolidated Mines, that air freight transport by Bristol Freighter is cheaper per ton than ground transport in Canada's far northern mining areas. Mr. H. H. Singer, resident engineer, stated that this had been proved by current operations at the Company's tungsten-gold property 150 miles north-east of Yellowknife Town.



Unloading an air compressor from the Bristol Freighter at an airstrip cleared on the frozen ice of O'Connor Lake

Salmita, in its preparation for production this year, is flying in several hundreds of tons of supplies, equipment and personnel to meet its entire working programme for 1952. Figures so far have shown costs to be only \$90 per ton by air compared with \$160 per ton by tractor train.

Supplies and equipment are flown directly to the mine by Associated Airways Ltd., the machine utilized being a Bristol Freighter. It commences route from an assembly point at the town of Hay River on the south shore of the Great Slave Lake, and travels to the new airstrip that has been specially bulldozed on the Salmita property beside Matthews Lake. The freighter carries from six to seven tons per trip.

The most interesting feature of the entire operation has been that a complete 100-ton mill is being flown to the mine from Yellowknife, together with additional equipment capable of stepping up capacity to 300 tons per day. The first cargo to arrive was the mining team, whose immediate task is to enlarge the shaft from two to three compartments and to deepen it to 300 ft. for second level operations. This work will be progressing concurrently with the erection of the mill.

Flying operations ceased on May 18, when the ice broke up.

The Freighter has also been chartered to fly supplies to Joe Indian Mountain Mines Ltd., where work has started on an extensive new exploration programme with the object of enlarging the 653,750 indicated tons of silver-lead-zinc ore, and assays from the first hole are expected shortly.

Associated Airways Ltd. serves over 1,000,000 sq. miles, and loads include buffalo meat as well as consignments of equipment for the uranium active area served by Goldfield, Saskatchewan. Between March 31 and May 18 of this year the Freighter carried about 455 tons and in the 30 days of April alone, flew more than 30,000 revenue miles.

First Coal Preparation Plant in India

The General Electric Co. of India Ltd., has recently commissioned at West Bokaro Colliery, Bihar, the first coal cleaning plant to be installed in India. The plant operates on the Chance Sand Flotation Process, already well established in the U.S.A., South Africa, and this country, and is giving excellent results with coal which is difficult to clean. The plant has a capacity of 135 tons per hour.

This installation is of particular importance to India, because her reserves of good class coking coal were rapidly diminishing and the remaining reserves were unsuitable for the blast

furnaces at Jamshedpur without being upgraded. The coal, which is extremely difficult to wash efficiently, is separated at two specific gravities, producing a low ash content coking coal, a medium ash content boiler fuel, and a high ash content refuse which is disposed of at the mine.

The Bray H.L. Hydraloader

The new H.L. series of Bray Hydraloader was demonstrated at the Feltham plant of W. E. Bray & Co. Ltd. on Tuesday, July 8, together with the wide range of ancillary attachments. The equipment is particularly suitable for export, and is designed for general work in quarries and on the surface at mining properties for earthmoving, tidying dumps, and like duties.

The three models of Hydraloader are denominated 21 H.L., 27 H.L., and 33 H.L., being $\frac{1}{2}$ cu. yd., 1 cu. yd. and $1\frac{1}{2}$ cu. yd. capacities respectively. The unit is powered by a Fordson Major four cylinder engine of 3,740 in. bore in the petrol model, and 3,937 in. in the T.V.O. and Diesel. All types of the engine have a stroke of 4,524 in. and fuel tank capacities are 15 gall. in the petrol and Diesel types, and 14 gall. in the T.V.O. The petrol engine develops 40.5 b.h.p. at 1,700 r.p.m., the T.V.O. 39.3 b.h.p. at 1,700 r.p.m., and the Diesel 41.6 b.h.p. at 1,700 r.p.m. Electric starting is fitted as standard equipment and electric lighting and other fittings are optional.

Overall dimensions show the Hydraloader to have a wheel-base of 6 ft. 3 in., a length with bucket lowered of 15 ft. 1 in. and a length with bucket raised of 12 ft. 3 in. Its height with bucket raised is 13 ft. 9 in., while its maximum discharge height is 9 ft. 3 in. The operating weight is 4 tons, 15 cwt., 2 qrs., and road speeds range from 1.67 m.p.h. in first gear to 10.06 m.p.h. in sixth gear. There are two reverse gears of maximum speed 4.05 m.p.h.

The construction is of folded steel sections throughout and salient among the features demonstrated was the hydraulic crowd action of the bucket. This action enables the operator to tilt the bucket back as it is lifted from the stockpile, thus ensuring minimum spillage. An additional advantage is that wet concrete can be carried without the necessity of a special attachment. The hydraulic bucket control in addition permits materials to be discharged in part or entirely as desired.



The Bray 21 H.L. Hydraloader

Ancillary equipments include a removable cab, dozer blade, crane attachment, fork lift, skeleton rock bucket, snow plough and the like. Distribution in Great Britain will be effected by the manufacturers and their distributors, George Cohen, Sons & Co. Ltd., Thomas W. Ward Ltd., Greenham Equipments Ltd., and Alexander Motor Co. Ltd.

METALS, MINERALS AND ALLOYS

By going into its seventh week, the U.S. steel strike has lasted longer than the 1949 strike. Hopes of an early settlement grow periodically, but they wither away just as frequently and a settlement seems as far off as ever. President Truman still refuses to invoke the Taft-Hartley Act, which provides for a cooling off period of 80 days and for the workers to have a secret ballot whether they shall return to work or not. The Act went into law, despite President Truman's veto.

A tale of consequential losses continues to grow. Several automobile plants are closing this week and the canning industry is now heavily hit.

The supply of four non-ferrous metals in the U.S., aluminium, copper, tungsten and tin, has improved so greatly recently that they have been removed from "the most critical" list of basic materials issued by D.P.A. The reason for the better supply of copper is the new freedom of manufacturers to buy foreign copper and to pass on 80 per cent of the increased costs to customers.

Further signs of the easing supply position for the non-ferrous metals are to be found in the increased I.M.C. allocations announced for the third quarter, and the new provision allowing "domestic" (i.e., non-Government) users to buy the unused portion of any country's allocation.

COPPER.—Following the increase in the price of electrolytic copper reported last week, the Ministry of Materials buying price for rough copper in slabs of two to three cwt. is to be increased to £235 from £230 per ton.

The I.M.C. has about 2½ per cent more copper to allocate in the third quarter of the year as compared with the second quarter. The U.S. has a quota of 368,100 tonnes out of a total of 744,000 tonnes. The fact that she was this time allowed a slightly higher allocation of copper to cover stockpiling is perhaps indicative of an easement in the supply position, of which there is further indication in the table on the opposite page. The U.K. quota is 100,300 tonnes (97,200) and Western Germany 50,100 (49,550). Chile continues to reserve its right to sell part of its production outside of the I.M.C. allocations.

The report given in our issue of April 25, that the R.F.C. was considering lending money to San Manuel Copper (a subsidiary of Magma Copper) to open a copper mine in Pinal County, Arizona, is confirmed by the news that the loan (stated to be \$94,000,000) has been approved. The mine would not be in production until 1957, but it is expected that full production would yield 70,000 s.tons of copper per annum. This would be equal to an additional 8 per cent on the U.S. domestic production in 1951. The project will add greatly to the production of molybdenum. The agreement with D.M.P.A. for purchase of the metals is still being negotiated.

Union Minière du Haut Katanga is keeping step with changes in the world price of copper. Its selling agent has increased the price of electrolytic copper to 37.55 Belgian francs per kilo, ex plant (£268 per ton). President Gonzales is reported from Santiago to have said that the Chilean price of copper was holding firm at 35½c. per lb. (£284 per ton).

LEAD.—As our London Metal Exchange Correspondent reports elsewhere, the U.K. Government is believed to be again selling lead to the U.S., presumably for D.M.P.A.'s "civilian stockpile." Our stock position is such that these reports are certainly credible. According to the British Bureau of Non-Ferrous Metals, Government stocks have risen from 53,362 tons at the end of December to 104,594 tons at the end of last May. It will be recalled that the Ministry of Materials sold two parcels of lead amounting to 53,000 tons in the early months of this year. The lead, which was of Canadian and Australian origin, was diverted direct to the U.S.

Smelters and refiners in the U.S. were estimated to be holding 48,844 tons of refined lead in stock at the end of May, as compared with 32,174 tons a month earlier and 24,901 tons a year previously.

TIN.—Mr. H. S. Lee, president of All-Malaya Chinese Mining Association, has added his quota of shot and shell in the battle against the export duty. In certain cases, Mr. Lee

said, the duty weighed so heavily on the shoulders of producers of marginal mines, that it would not be worth while continuing mining operations. This is no idle threat; production from the Chinese mines had dropped from 21,181 tons in 1950 to 19,208 tons in 1951.

The American Metal Market has examined the future availability of Bolivian tin and has attacked the assumption that the capitalist world will always deal in commodities, even if confiscated, and that, if hostilities break out, the free world would be deprived of tin from Malaya and Indonesia. In controverting the first contention, it cites Iran and the boycott of Iranian oil, and in criticizing the second, it points out that the free world dominates the approaches to the Far Eastern tin-bearing lands. It speaks of the peril that nationalization in Bolivia might force up costs of this high-cost producer. The Bolivian Government is reported to have offered the whole output of Bolivian tin on a long-term contract at a price around the existing price of \$1.21½ per lb. (£972 per ton). It would be interesting to know if there will be any clauses providing for the adjustment of the price if conditions change later.

ZINC.—The effect of the U.S. steel strike on the zinc smelting industry can be seen well in the latest figures issued by the American Zinc Institute. Shipments to domestic consumers were only 36,754 tons in June, whereas they were 80,121 in March. Since that month shipments have been steadily falling. As a result of these changes, stocks have jumped up to 63,031 tons in June. At the end of April stocks were 23,423 tons; thus, in two months, stocks almost trebled.

ALUMINIUM.—Production of primary aluminium in the U.S. continues to expand. Output in May, 80,803 s.tons, was the largest monthly total since January, 1944. This increase in the May output has helped to raise production in the first five months of the year to 384,060 tons, or 19 per cent more than the corresponding period of 1951.

Although the Aluminium Company of America has negotiated a five year agreement on wages with 9,500 of its workers, there are still 15,000 workers not yet covered. The reason for the discrepancy is that the agreement covering the first set of workers was negotiated by the American Federation of Labour's Aluminium Workers of America, but the remaining workers belong to the Steelworkers' Union which is in the C.I.O. set-up. The A.F. of L. has agreed to a 10 per cent general wage increase and an escalator cost-of-living clause. The C.I.O. prefers to wait for the award still being considered by the Wage Stabilization Board.

COBALT.—The amount of cobalt to be allocated by I.M.C. during the third quarter, 2,475 tonnes, cannot be compared with the amount distributed during the second quarter, for earlier this year the I.M.C. allocated cobalt on a six monthly basis. The bulk of the allocation goes to the U.S. which is entitled to 1,584 tonnes. The U.K. takes 360 tonnes and Western Germany 147 tonnes.

MOLYBDENUM.—The loan of \$94,000,000 to the San Manuel Copper Corporation mentioned in the notes on copper, will enable the company to achieve an output of 3,000 s.tons of molybdenum, an increase of no less than 16 per cent above the U.S. domestic output level in 1951.

D.M.P.A. has agreed to buy 2,500 s.tons of molybdenum to be produced from low-grade ore by Climax Molybdenum. Without government assistance this tonnage would be lost because the costs of production and processing this low-grade ore are high.

Out of the 5,650 tonnes of molybdenum allocated by the I.M.C. for the third quarter of the year, 4,128 tonnes goes to the U.S. The U.K. has been given the next large share with 631 tonnes and France comes into third place with 304 tonnes.

NICKEL.—The I.M.C. allocations of nickel are slowly expanding. In the first quarter of the year they amounted to 33,600 tonnes; in the second 35,000 tonnes, and for the third quarter, 36,600 tonnes. The U.K. quota has been raised from 5,326 tonnes to 5,428 tonnes. The U.S. is to obtain 24,626 tonnes (23,726), France 1,764 tonnes (1,725) and Western Germany

1,379 tonnes. The I.M.C. is unable to forecast when the international distribution scheme can be suspended.

SULPHUR.—Wellington reports state that an English syndicate is to start boring shortly in sulphur beds north of Taupo, in the North Island.

TUNGSTEN.—The U.K. Ministry of materials is maintaining its buying price at 425s. per 1.0 ton unit c.i.f., but the selling price of standard 65 per cent grade, ordinary quality has been reduced from 467s. 6d. to 447s. 6d.

Although world production of tungsten is rising, the metal continues to be scarce. I.M.C. has allocated 4,690 tonnes for the third quarter. In this instance I.M.C. is reverting to the old system of making allocations quarterly instead of half yearly. The U.S. quota of 2,335 tonnes is roughly one-half of the total. The U.K. takes 1,000 tonnes and Western Germany 470 tonnes.

The London Metal Market

(From Our Metal Exchange Correspondent)

The main feature of the tin market during the past week has been the continuance of the steady advance in the Eastern quotation which, at approximately £92 c.i.f., stands at the highest figure recorded since early in March. The most popular reason for this points to a fair demand from the Continent for float tin which, in due course, finds its way to America resulting in the Continental dealer benefiting by the dollar exchange premium granted by certain countries but the point is rapidly being reached when this will no longer be a profitable form of business. In addition it is understood that offerings of metal on the Singapore market have been on a reduced scale. In London, however, with a rise of only about £3 10s. per ton in the price for three months metal the span between the two quotations has widened still further. Daily turnovers remain on the low side and the backwardation stands at about £2 10s. following a further rise in the warehouse stocks at the end of last week of just over 100 tons to 1,439 tons.

On July 10, the official price of lead was reduced by the Ministry of Materials by £6 per ton to £131 delivered, due in all probability to the American quotation now being on a "duty paid" basis. It is reported that the Government have sold a considerable quantity of lead to the U.S. in the last week or so, and some estimates place this at approaching 40,000 tons with, in all probability, more being available given the selling opportunity.

Following another breakdown in the talks the possibilities of an early settlement of the U.S. steel strike appear as remote as ever as a consequence of which the zinc market remains featureless.

On Thursday the official close on the tin market was: Settlement price £972, Cash Buyers £972, Sellers £972 10s., Three months' Buyers £970, Sellers £970 10s. In the afternoon the market was steady. Turnover for the day was 100 tons. Approximate turnover for the week was 470 tons.

The Eastern price on Thursday morning was equivalent to £993 12s. 6d. per ton c.i.f. Europe.

Iron and Steel

The June performance of the steel industry in raising the annual rate of production to 16,250,000 tons per annum is highly satisfactory. It reflects the steady improvement in fuel and ore supplies, which has made possible the starting of five new blast furnaces since the end of May. The increase in pig iron production has offset the scarcity of scrap and should make possible the further expansion of steel production after the holidays.

Consumers have however been forewarned of an impending shrinkage in supplies. The total tonnage available for distribution in the third quarter is expected to be slightly less than was distributed in the second period. And this forecast leaves out of the reckoning the duration of the U.S. steel strike now in its eighth week. Already the loss of production is serious and unless there is a speedy settlement it may be impossible to implement the agreement to ship 1,000,000 tons of steel to this country before the end of the year.

The home demand for iron and steel products is very con-

siderably in excess of the supply. Every application is closely vetted and even the engineering and shipbuilding trades are receiving tonnages which are well below their minimum requirements. Export markets on the other hand are dull.

There has been some relaxation of the pressure for pig iron, chiefly because of the imminence of the holiday period. The starting of a blast furnace at Kettering also promises an extra output of foundry iron to the extent of about 1,000 tons a week. Foundrymen, however, have still only very slender stocks and their needs are such that it is not yet possible to sanction the renewal of the export trade in pig iron.

REFINED COPPER PRODUCTION AND STOCKS—JUNE

(000 s.tons)

	Production			Stocks		
	June, 1952	Jan.-June, 1952	Jan.-June, 1951	June 30, 1952	May 31, 1952	June 30, 1951
U.S.A.	92	579	646	71	55	61
Other countries	114	623	586	193	177	152
World.....	206	1,202	1,232	264	226	213

Source: American Copper Institute.

JULY 17 PRICES

COPPER

Electrolytic £287 0 0 d/d

TIN

(See our London Metal Exchange report for Thursday's prices)

LEAD

Soft foreign, duty paid £131 0 0 d/d

Soft empire £131 0 0 d/d

English lead £132 10 0 nom.

ZINC

G.O.B. spelter, foreign, duty paid ... £130 0 0 d/d

G.O.B. spelter, domestic £130 0 0 d/d

Electrolytic and refined zinc £134 0 0 d/d

ANTIMONY

English (99%) delivered,
10 cwt. and over £225 per ton
Crude (70%) £210 per ton
Ore (60% basis) 25s.—27/6 nom. per unit, c.i.f.

NICKEL

99.5% (home trade) £454 per ton

OTHER METALS

Aluminium, £157 per ton.
Bismuth, 19s. lb.
Cadmium, 16s. lb.
Chromium, 6s. 5d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.o.z.
Iridium, £65 oz. nom.
Magnesium, 2s. 10d. lb.
Manganese Metal (96%-98%)
2s. 2d./2s. 3d. per lb. d/d
Osmiridium, £35 oz. nom.
Osmium, £70 oz. nom.
Palladium, £8 10s. oz.
Platinum, £27/33 5s. nom.
Rhodium, £45 oz.
Ruthenium, £30 oz.
Quicksilver, £65/£65 10s. ex-warehouse
Scandium, 25s. nom. per lb.
Silver 72½d. f.o.z. spot and f'd.
Tellurium, 18s./19s. lb.

ORES, ALLOYS, ETC.

Bismuth 30% 6s. 9d. lb. c.i.f.
20% 4s. 6d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 2s. per ton c.i.f.
" " (concentrates) £14 2s. per ton c.i.f.
" " Refractory £13 14s. per ton c.i.f.
Baluchistan Metallurgical ... £15 8s. per ton c.i.f.
Magnesite, ground calcined ... £26 - £27 d/d
Magnesite, Raw £10 - £11 d/d
Molybdenite (85% basis) ... 104s. 9d. per unit c.i.f.
Wolfram (65%), U.K. ... 425s. nom. c.i.f.
Tungsten Metal Powder (for steel manufacture) 32s. 9d. nom. per lb. (home)
Ferro-tungsten 29s. 9d. nom. per lb. (home)
Carbide, 4-cwt. lots £30 3s. 9d. d/d per ton
Ferro-manganese, home ... £43 15s. 2d. per ton
Manganese Ore U.K. (48%-50%) 72d. per unit
Brass Wire 2s. 9½d. per lb. basis.
Brass Tubes, solid drawn ... 2s. 3½d. per lb. basis.

COMPANY NEWS AND VIEWS

Amalgamated Banket Pays 2½ Per Cent.

Impressive production results of Amalgamated Banket Areas for the year ended September 30, 1951, lie behind the company's welcome return to the dividend list after an absence of 14 years with the payment of 2½ per cent.

Year to Sept. 30	Tonnage Milled (Total)	(Per Month)	Grade (dwt.)	Re- covery %	Yield (oz.)	Cost per ton* s. d.
1950	537,690	44,807	3.0	95.5	79,002	26 1
1951	656,545	54,712	2.9	95.3	93,749	26 7

*Including development charges.

Tonnage mined and milled at 656,545 tons established a record for the third successive year and showed an increase over the previous year of 118,855 tons. While the grade of ore sent to the mill was fractionally lower, the expansion in the mill throughput to near optimum capacity more than offset this insignificant decline and output improved by some 14,000 oz. More than that, it enabled a small decrease in operating costs to be achieved which in the face of higher charges all round was no mean feat. Actually the increase in costs by 6d. per ton noted in the table below, included development charges and reflects an advance in footage developed by 7,028 ft. to 26,213 ft., which raised development charges from 2s. 9d. to 3s. 3d.

Year to Sept. 30	Bullion* Revenue	Mining Costs	Other Expenses	Net Profit	Divi- dend %	Carry Forward
1950	1,047,014	688,915	155,443	203,402	Nil	126,452
1951	1,159,412	763,999	168,682	227,497	2½	202,867

*Less realization charges.

These excellent results were responsible for an improvement in the bullion revenue by over £100,000 and despite the heavy increase in costs, net profits was some £24,000 better than in the preceding year. But expenditure pending resumption of production at the Fanti and Tamsoo mines, amounting to £113,106 (£64,297) was charged against profits so that after distributing 2½ per cent which absorbed £37,864 and writing off £112 there remained £76,415 to add to the £126,452 brought in giving a credit balance on the profit and loss account to be carried forward of £208,267.

Although results from development work carried out during the year were generally encouraging, exposures in the A.B.A. Section were disappointing. But development work undertaken since the end of the company's fiscal year has met with some success and the reef on Level 20 of the Abbotiako mine has been sampled over a length of 620 ft. giving an average value of 5.7 dwt. per ton over a width of 39.5 in.

During the year under review the first stage of the amalgamation programme was attained when the aerial ropeway linking the Tamsoo mine with the central mill was completed in June 1951, since when a steady flow of ore from Tamsoo has been sent to the Central mill. It was hoped that the final stage of the programme, the linking of the Fanti mine to the Central mill by aerial ropeway, would be completed in the autumn of the current year, but delays in steel deliveries have held up the amount of work that could be done on this project and the completion date is not now expected until some time in the spring of 1953.

Marlu Clears its Debit Balance

During the year ended September 30, 1951, Marlu Gold Mining Areas was not able to maintain the very satisfactory progress made in the previous year when a net profit of £187,570 was recorded. Both the tonnage and the grade of ore put through the mill declined compared with 1950 while the drop in percentage recovery indicates that metallurgical difficulties encountered have not been overcome. Moreover, output declined by nearly 10,000 oz. while costs, including development charges were 2s. 8d. per ton higher at 18s. 11d.

Year to Sept. 30	Tonnage Milled (Total)	(per month)	Grade (dwt.)	Re- covery %	Yield (oz.)	Cost per ton* s. d.
1950	500,740	41,728	2.4	85.9	52,036	16 3
1951	471,180	39,265	2.2	80.3	42,547	18 11

*Including development charges.

Thus with the lower bullion revenue and higher costs net profit slumped to £32,494. Yet with the passing of the dividend there was sufficient to wipe out the debit balance, which in 1949 amounted to approximately £215,000, and enabled the company for the first time since 1940 to record a credit balance on profit and loss account to be carried forward.

Year to Sept. 30	Bullion* Revenue	Mining Costs	Other Expenses	Net Profit	Divi- dend %	Carry Forward
1950	642,533	404,629	50,334	187,570	Nil	Dr. 27,188
1951	525,316	445,259	47,563	32,494	Nil	£ 5,303

*Less realization charges.

While it must be conceded that the company had to contend with many difficulties beyond its control in the year under review, such as the abnormally heavy rains, which to some extent interfered with all the work done in the open, and the shortage of ore cars, this is not to say that given reasonable weather conditions and adequate transport facilities Marlu would be able to return, assuredly and speedily, to the list of dividend payers. Indeed, the heart of the problem seems to reside somewhere around the treatment plant which is experiencing a good deal of trouble in treating the refractory ores, coming from opencast mining operations, and the recovery of just over 80 per cent will certainly have to be improved upon if the company is to win its battle against the upward trend of costs. A much improved percentage recovery is particularly essential to Marlu in view of the fact that the oxidized surface ore deposits, which constitute the major proportion of its ore reserves, are low-grade (in the main averaging only 2.5 dwt. per ton) and therefore, to carry on profitable mining operations it is necessary that the company mine large tonnages from which the maximum gold content can be extracted.

Shareholders will view the results of the first four months of the current financial year with mixed feelings. The tonnage throughput has increased as has the grade of ore sent to the mill while milling costs show a welcome decline from 7s. 10d. to 7s. 4d. per ton. But little encouragement can be taken from the recovery percentage figures given, which for this four month period has dropped to 73.3 per cent. In mitigation of this figure, however, it must be said that this additional drop was probably wholly due to the graphitic and pyritic nature of the ore mined from the bottom levels of two of the sections.

Lobitos Oilfields Results for 1951

The Consolidated profit and loss account of Lobitos Oilfields for the calendar year 1951 showed that after meeting all expenses, including £432,141 (£338,597) for Peruvian taxation and £636,827 (£442,743) for U.K. taxation, net profit amounted to £470,025 against £573,283 in 1950. The aggregate dividend distribution was maintained at 15 per cent plus a bonus of 7½ per cent (same) absorbing £118,125, and after allocating £288,279 (£232,940) to reserves the group carry forward was £806,978 compared with £731,741 brought in.

Bremang Gold Pays Same

Bremang Gold Dredging in a preliminary statement announce the recommendation of 4½d. per stock unit (same) for the year 1951. Net profit for the year, after providing £88,238 (£63,725) for taxation, was £58,654 compared with £55,910 in 1950. The dividend payment required £41,509 and the carry forward amounted to £41,964, against £24,819 brought in.

Harmony's Ventilation Shaft Strike Gives 478 in.-dwt.

Harmony Gold Mining has announced that the ventilation shaft intersected the Leader reef at 4,335 ft. below the collar and that sampling around the circumference of the shaft at 5 ft. intervals gave an average "un-discounted" value of 1.06 dwt. over a channel width of 50.4 in., or 53 in.-dwt. Six days later on July 14 the shaft intersected the Basal reef at a depth of 4,364 ft. below the collar and sampling at 5 ft. intervals around the circumference of the shaft gave an average "un-discounted" value of 10.08 dwt. over a channel width of 47.4 in. equivalent to 478 in.-dwt. The dip of both reefs, the statement adds, was approximately 9 deg. west.

BISICHI TIN (NIGERIA)

The Forty-First Annual General Meeting of Bisichi Tin Co. (Nigeria) Ltd., was held on July 14 at Winchester House, London, E.C.

Mr. O. V. G. Hoare, chairman of the company, presided.

The following is an extract from his statement, which was circulated with the report and accounts for the year ended December 31, 1951:

Production of both tin and columbite showed very satisfactory increases compared with the previous year—672 tons tin and 166 tons columbite, compared with 450 tons tin and 130 tons columbite. Proceeds for the metals was £645,546—that is £230,000 up on last year's figure. The price of tin averaged £956 per ton and for columbite £1,384 per ton. The selling price for tin was less than the previous year by £98, but columbite was higher by £740 per ton.

On the expenditure account, mine operating costs showed an increase of £112,000 due to higher labour costs and the increased payments for tribute tin. The royalty imposed by the Nigerian Government aggregated £93,704, an increase of nearly £55,000.

The net profit for the year available for distribution to the members is £88,307. I would like to draw particular attention to the fact that the royalty paid to the Nigerian Government, plus the income and profits tax assessments aggregate £221,954, more than double the profit available to members. An interim dividend of 3d. per share, less income tax, was paid in July last, and the Board now recommend the payment of a final dividend of 4.5d., making a distribution of 7.5d. per share for the year. This will leave a carry forward on the profit and loss account of £61,786.

Satisfactory returns continue to come in from the mines—the output for the current year to the end of May was 279 tons of tin and 78 tons of columbite. This compares with 298 tons tin and 71 tons columbite for the corresponding period of last year. The directors have decided that the payment of an interim dividend is justified on account of this year, and they have, therefore, declared a dividend of 3d. per share on this account.

Some 18,000 ft. of drilling and pitting was carried out at a cost of £2,500. This work was necessary to comply with the requirements of the Minerals Ordinance, and at the same time gives an indication as to the possible extension of the tin and columbite ore reserves. The proved reserves at December 31, 1951, were 4,149 tons of tin and 701 tons columbite.

The power supply was well maintained throughout the year without serious interruption. The labour position has been reasonably satisfactory.

The report and accounts were adopted.

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Mining Men

Mr. A. G. Glenister has been re-elected chairman of the Malayan Chamber of Mines and **Mr. R. C. Savory** has been re-elected vice-chairman of the Chamber.

Mr. P. V. Hunter has resigned his position as deputy chairman of British Insulated Callenders' Cable. Mr. Hunter, however, will continue as a non-executive director and, at the request of the company, will remain on the boards of several of B.I.C.C.'s subsidiary companies.

Mr. Albert James Kelman has been appointed a director of Ayer Hitam Tin Dredging.

Mr. Leslie O'Connor has been released from his duties as director-general of carbonization with the National Coal Board to take up his new post as deputy chairman and director of the British Coking Association.

Mr. E. D. Shearn and **Mr. W. M. Warren** have been elected to the Council of the Malayan Chamber of Mines, following the creation of two vacancies on the Council approved at the recent extraordinary general meeting of the Malayan Chamber of Mines.

Mr. H. J. Stockden has been appointed reduction officer of Western Holdings.

The **Metz Trade Fair** will take place this year from September 27 to October 13 in Metz, France. Agents for the Metz Trade Fair in Great Britain are Home & Overseas Trade Fairs, 40, Gerrard Street, London, W.1.

Coronation Syndicate Board Changes.—Certain changes have been made in the composition of the board of Coronation Syndicate, which is now constituted as follows: Mr. J. H. Mitchell, chairman, Mr. H. N. Clackworthy, Mr. L. P. Kent, Mr. J. H. Dreyer, Mr. M. Ralphs, Mr. R. S. Walker and Mr. H. Tevis.

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The following Minerals

PHENACITE, ANDALUSITE, WHITE TOURMALINES, BERYLS, AZURITE, LAZULITE, KYANITE, MALACHITE, ORTHOCLASE, BLUE IOLITE, ENSTATITE, AXINITE, CHRYSOPRASE, TRANSPARENT CASSITERITE, ETC.

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SURVEYORS. Vacancies occur for Mine Surveyors for leading Gold Mine in West Africa. Applicants preferably with Home Office Certificate. First tour of 15 months abroad followed by 3 months' leave on full pay. Subsequent tours of 12 months. Passages, furnished quarters and medical attention provided free. A Pension Scheme is in operation. Write stating age, experience and salary required to Box E939, Whites, Ltd., 72 Fleet Street, London, E.C.4.

WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE

The Governing Body invites applications for a post as LECTURER IN THE DEPARTMENT OF MINING AND GEOLOGY. Duties commence as soon as possible.

Candidates should hold a degree in Mining or Fuel Technology, and have suitable industrial experience. Salary in accordance with the Burnham Technical Scale for Assistants Grade "A" or "B" according to qualifications and experience.

Further particulars and application form will be sent by the undersigned on receipt of a stamped addressed foolscap envelope. Last date for receipt of applications: Friday, 15th August, 1952. Applications not on the form provided will be disregarded.

E. C. SMITH,
Principal.

10th July, 1952.

SITUATIONS VACANT ADVERTISED.—The Notification of Vacancies Order, 1952, must be complied with where applicable.

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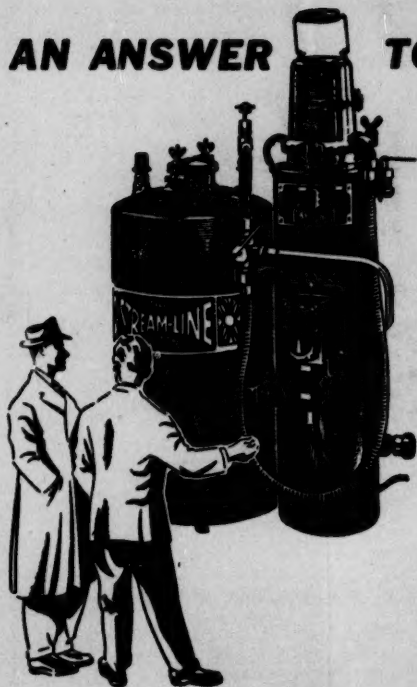
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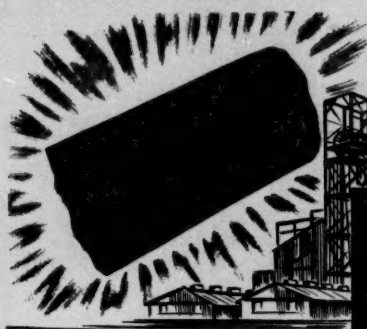
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